

## **REMARKS**

The present Amendment is in response to the Office Action mailed March 30, 2009. By this paper, claims 1, 2, and 4 are amended, no claims are cancelled, and new claims 7 and 8 are added. Claims 1-8 are now pending in view of the above amendments.

Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

### **I. General Considerations**

#### **a. Claim Amendments**

With particular reference to the claim amendments, Applicants note that, while claims 1, 2, and 4 have been amended herein, such amendments have been made in the interest of expediting the allowance of this case. Notwithstanding, Applicants may, on further consideration, determine that claims of broader scope than those now presented are supported. Accordingly, Applicants hereby reserve the right to file one or more continuing applications with claims broader in scope than the claims now presented.

Consistent with the points set forth above, Applicants submit that neither the claim amendments set forth herein, nor any other claim amendments, claim cancellations or statements advanced by the Applicants in this or any related case, constitute or should be construed as, an implicit or explicit surrender or disclaimer of claim scope with respect to the cited, or any other, references.

#### **b. Remarks**

Applicants respectfully note that the remarks herein do not constitute, nor are they intended to be, an exhaustive enumeration of the patentable distinctions between any cited references and the invention, or example embodiments of which are set forth in the claims of this application. Rather, and in consideration of the fact that various factors make it impractical to enumerate all the patentable distinctions between the invention and the cited art, as well as the fact that the Applicants have broad discretion

in terms of the identification and consideration of the base(s) upon which the claims distinguish over the cited references, the distinctions identified and discussed herein are presented solely by way of example. Consistent with the foregoing, the discussion herein is not intended, and should not be construed, to prejudice or foreclose contemporaneous or future consideration by the Applicants, in this case or any other, of additional or alternative distinctions between the invention and the cited references and/or the merits of additional or alternative arguments.

Moreover, Applicants note that the remarks, or a lack of remarks, set forth herein are not intended to constitute, and should not be construed as, an acquiescence on the part of the Applicants: as to the purported teachings or prior art status of the cited references; as to the characterization of the cited references advanced by the Examiner; or as to any other assertions, allegations or characterizations made by the Examiner at any time in this case. Applicants reserve the right to challenge the purported teachings and purported prior art status of the cited references at any appropriate time.

**c. Present Understanding of the References**

In connection with the prosecution of this case, as well as any related cases, the Applicants have, and/or may, discuss various aspects of the disclosure of the cited references as those references are then understood by the Applicants. Inasmuch as such discussion could, at times, reflect an incomplete or incorrect understanding of one or more of the references however, the position of the Applicants with respect to a reference is not necessarily fixed or irrevocable, and Applicants hereby reserve the right, both during and after prosecution of this case, to modify the views expressed with regard to such reference.

**Rejection Under 35 U.S.C. §103**

The Office Action rejects claims 1-6 under 35 U.S.C. § 103 as being unpatentable over United States Patent No. 6,535,316 to Mizuhara ("Mizuhara") in view of United States Patent No. 6,559,996 to Miyamoto ("Miyamoto"). Applicants respectfully traverse this rejection for the reasons that will now be explained.

According to the applicable statute, a claimed invention is unpatentable for obviousness if the differences between it and the prior art "are such that the subject

matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.” 35 U.S.C. § 103(a) (2005); *Graham v. John Deere Co.*, 383 U.S. 1, 14 (1966); MPEP 2142. Obviousness is a legal question based on underlying factual determinations including: (1) the scope and content of the prior art, including what that prior art teaches explicitly and inherently; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18; *In re Dembiczak*, 175 F.3d 994, 998 (Fed. Cir. 1999).

“The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious.” MPEP 2142 (2007). Analysis supporting a rejection under 35 U.S.C. §103(a) should be made explicit. *KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, (2007). Moreover, the Patent Office must identify a reason (such as motivation) why a person of ordinary skill in the art at the time of the invention would have combined the prior art elements in the manner claimed. *Id.* “[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id. quoting In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006); see also MPEP 2142. A court should be wary of reasoning based on hindsight. See *Graham*, 383 U.S. at 36.

It is the initial burden of the PTO to demonstrate a *prima facie* case of obviousness. If the PTO does not set forth a *prima facie* case of obviousness, the applicant is under no obligation to submit evidence of nonobviousness. MPEP 2142 (emphasis added). Title 35 requires the analysis to examine "the subject matter as a whole" to ascertain if it "would have been obvious at the time the invention was made." 35 U.S.C. § 103(a) (emphasis added).

Embodiments of the pending claims relate to an optical differential phase shift keyed RZ transmitter that includes a differential encoder having first and second outputs, the first and second outputs being of opposite polarity to one another, a first RZ converter connected to the first output of the differential encoder and a second RZ converter connected to the second output of the differential encoder, and a dual electrode Mach Zehnder modulator to which an unmodulated coherent light source is

coupled. The output of the first RZ converter is connected to a first electrode of the Mach Zehnder modulator and the output of the second RZ converter is connected to a second electrode of the Mach Zehnder modulator. The first and second electrodes are driven by the outputs of the first and second RZ converters sequentially such that an output light signal of the Mach Zehnder modulator is pushed out of phase by driving the first electrode or pulled out of phase by driving the second electrode.

Independent claims 1 and 4 have been amended to further distinguish over the cited art. Support for such amendments is found at least in Figures 2 and 3 and paragraph [0031] of the originally filed specification.

That is to say, the amended claims are arranged such that *either* the first modulator arm *or* the second modulator arm is being driven. This contrasts with the cited prior art, in which pulses are created by driving both arms of the modulator simultaneously.

For example, Mizuhara teaches that a signal 301a and 301b are provided to RZ converters 302a and 302b to produce RZ electrical signals 303a and 303b. Signal 302b is then inverted to create a negative amplitude signal 303b'. The signals 303a and 303b' are then provided to a modulator 305, which also receives a laser signal 309. The modular performs signal inversion on one of the RZ signals to generate in phase signals that are used to modulate the laser signal 309.

Thus, there is no mention in Mizuhara of driving the arms of the modulator sequentially as recited in the amended claims. Rather, the modulator 305 places the RZ signals in phase. In addition, it appears that the modulator arms of Mizuhara are driven simultaneously.

Miyamoto also fails to disclose the newly amended limitations. For example, Miyamoto describes how in order to create a pulse having a first phase state the first arm is "pushed" while the second arm is "pulled". In order to create a pulse with the opposite phase the first arm is "pulled" while the second arm is "pushed". In this way, the prior art is able to create pulses having two distinct phase states. However, in order to do so the input driving each arm of the modulator must have three distinct possible states (neutral, push, and pull). This is shown clearly in Figure 3 of Miyamoto and is indicated by the reference to "bipolar code converters" at column 9, line 46.

In contrast, the recited claims either "pushes" the first arm or "pulls" the second arm but does not do both simultaneously (see paragraph [0031]). There are a number of advantages that derive from this approach. Firstly, the input driving each arm need only have two states (neutral, and one of either "push" or "pull"). The approach adopted by the recited claims is simpler to implement with commercially available components, and provides consistent and good signal quality outputs. However, Miyamoto at column 9, line 53-column 10, line 10 teaches away from such an approach, arguing that it is beneficial for the drive signal to have no overall DC component. As such, it would not be obvious for one skilled in the art to alter the device disclosed in the prior art in such a way as to reach the pending claims. In fact, the majority of the advantages described at column 9, line 53-column 10, line 10 of Miyamoto rely on the use of both arms of the modulator simultaneously, which is an approach spurned by the pending claims.

Accordingly, Mizuhara and Miyamoto, either singularly or in combination, do not teach or suggest that first and second electrodes are driven by the outputs of the first and second RZ converters sequentially such that an output light signal of the Mach Zehnder modulator is pushed out of phase by driving the first electrode or pulled out of phase by driving the second electrode as recited in the amended claims.

As further proof that the cited art does not render the pending claims obvious, the Applicants note that on page 2, the Office Action acknowledges that Mizuhara does not teach several of the elements of the pending claims. Rather, the Office Action turns to Miyamoto to show these elements. However, Applicants respectfully note that the pending claims teach phase shift keyed data format. Miyamoto, on the other hand, does not relate to the production of such a format. Instead, Miyamoto relates to amplitude key shifted format (see Figure 3 of Miyamoto). The two types of formats are fundamentally different: while an amplitude shift keyed format encodes digital ones by transmitting light and digital zeros by the absence of light, phase shifted keyed formats transmit light for both ones and zeros but distinguish between the two by the phase of the transmitted light (see Figure 3 of the present application)

Miyamoto therefore does not provide an apparatus or a method for transmitting the claimed data format. In contrast, figure 3 of Miyamoto clearly shows that zeros are encoded by suppressing the optical signal. The fact that successive ones are arranged

to have opposite phase does not make this a phase shift keyed format. Figures 14 and 23 of Miyamoto also make it clear that it is an amplitude shift keyed format that is envisaged, as does optical output spectrum shown in Figure 5.

Amplitude shift and phase shift keyed formats are fundamentally different in terms of the modulation applied to the signal. As such, it would not be obvious to apply transmitters or methods designed to create amplitude shift keyed formats in the context of phase shift keyed formats of the type required by the pending claims. Accordingly, one of skill in the art would not be motivated to use the teachings of Miyamoto to produce the elements of the pending claims as the system of Miyamoto is not configured to work with system of the pending claims. Therefore, there is no rational reason for one of skill in the art to combine the teachings of Miyamoto with the teachings of Mizuhara to produce the system and methods of the pending claims.

The pending claims provides additional advantages over the prior art in that it is capable of applying appropriate chirp to the signal as the light is modulated. This is shown in Figure 3 of the present application and described in paragraph [0033] of the originally filed specification. The resulting signal is chirped precisely because only one modulator arm is driven at a given moment. The chirp arises at the transition points of the drive signal and the approach taken by the prior art, whereby the drive signal applied to the first modulator arm is a mirror image of that applied simultaneously to the second modulator arm, automatically cancels out any chirping effect. Indeed, the absence of chirp in the context of the amplitude shift keyed format of the prior art is likely desirable. However, the pending claims take advantage of this chirping effect to apply a controlled consistent chirp across the signal. Chirp of this kind has been found to improve dispersion tolerance across the transmission line and also suppress non-linear transmission penalties found in long haul systems. None of these aspects of the pending claims would have been obvious to one skilled in the art reading this cited prior art.

Accordingly, Applicants respectfully submit that the cited art fails, either singularly or in combination, to teach or disclose all of the elements of the amended claims. In addition, there is no rational reason to combine the cited art as discussed above. Applicants thus respectfully request that this rejection be withdrawn from the claims.

**New Claims**

As shown above, Applicants have added new claims 7 and 8. These claims further distinguish over the cited art. Support for such claims is found at least in Figure 2 and paragraph [0030] of the originally filed specification. Applicants note that these claims are allowed based on their dependence from claim 1. In addition, the cited art fails to teach or make obvious these claims.

### **CONCLUSION**

In view of the foregoing, Applicants believe the claims as amended are in allowable form and that every issue raised by the Office Action has been addressed. In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or which may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to Deposit Account No. 23-3178: (1) any filing fees required under 37 CFR § 1.16; (2) any patent application and reexamination processing fees under 37 CFR § 1.17; and/or (3) any post issuance fees under 37 CFR § 1.20. In addition, if any additional extension of time is required, which has not otherwise been requested, please consider this a petition therefore and charge any additional fees that may be required to Deposit Account No. 23-3178.

Dated this 30<sup>th</sup> day of June, 2009.

Respectfully submitted,

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